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AUTHOR Solomon, Gerard; And Others
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ABSTRACT

Complete with student worksheets, field trip ideas, illustrations, vocabulary lists, suggested materials, and step-by-step procedures, the document presents a compilation of ideas for teaching elementary school (K-6) students about marine and fresh water. In the first unit students build miniature monuments and observe the deterioration of monuments exposed to acid rain. In unit 2 students design filtration methods for cleaning up dirty water. Unit 3 focuses on developing familiarity with marine and/or fresh water environments by promoting field trips to the shore. For those unable to visit a shore, unit 4 describes a possible field trip to a local fish market. In a look at geometric shapes, unit 5 explores the similar shapes of living organisms and mechanical devices that move quickly through water. In units 6 and 7, mathematical skills are employed when students map their schoolyard to predict where puddles will form and when students evaluate water usage at home, at school, and in their town. In unit 8 students prepare an Irish moss seaweed extract to discover the properties of algae. In unit 9 students simulate an oil spill and later assess which clean-up materials work best. The final section gives instructions and patterns for creating an icosahedron mobile to accompany and illustrate the preceeding wet world activities. (LH)

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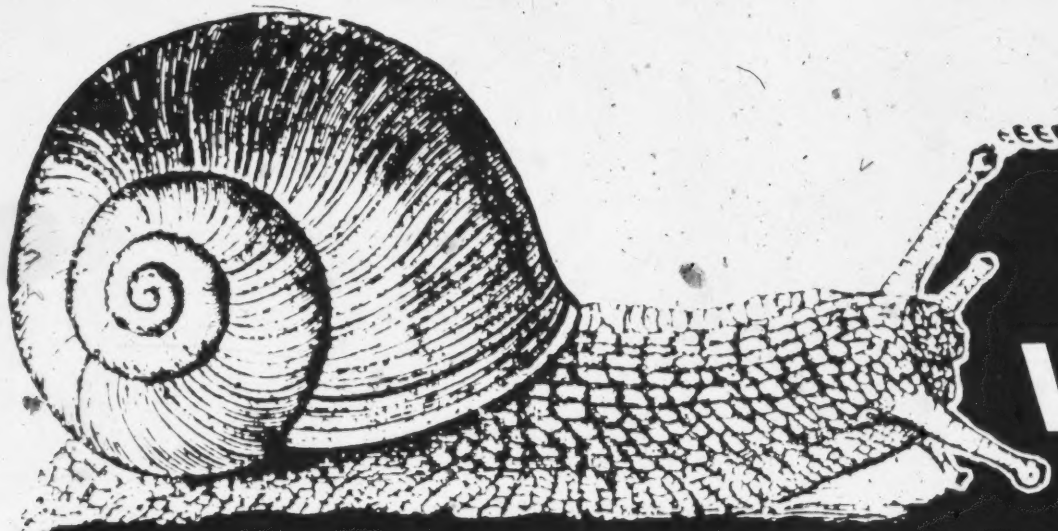

WET WORLDS

EXPLORE THE WORLD OF WATER

MARINE AND FRESH WATER ACTIVITIES
FOR THE ELEMENTARY CLASSROOM. . .

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130 Stuyvesant Place
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Gerard Solomon, Director

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MONUMENTAL PROBLEMS

Writer: GERARD SOLOMON, Design: CYNTHIA COSTA

New York State shares with the world the problems caused by **acid rain, acid snow** and **acid fog**. Upstate, in the Adirondack mountains, vast areas of woodlands, ponds and lakes have been damaged. "Acid from the sky" is also destructive in urban areas -- buildings and memorials are slowly melting under the acidic deluge.

Sulfuric and **Nitric acids** are the principal destructive ingredients of acidic precipitation. Their primary sources are burning coal and automobile emissions.

STIMULATE STUDENT AWARENESS OF THE PROBLEM OF ACID RAINFALL BY ALLOWING ACIDIC "RAIN" TO SHOWER DOWN ON STUDENT-MADE MONUMENTS.

UPPER GRADES

MATERIALS:

TEACHER:

Citric acid (sour salts--a seasoning obtainable in any supermarket)
Two empty gallon jugs
Water

FOR THE CLASS:

A sufficient number of sprinkler bottles of rain water and tap water.

FOR EACH TEAM OF TWO:

One planting tray (meat-packing trays could be used here).
Soil
Mustard and/or grass seed
Millimeter ruler

FOR EACH STUDENT:

Two sticks of blackboard chalk
Small amount of self-hardening clay

PREPARATION:

Teacher dissolves around two ounces of citric acid in a gallon jug of water. Label "rainwater." Fill other jug with plain tap water. Label "tap water." Replenish as necessary.

Prepare individual 1½ cubic inch blocks of clay. Doubling the amount of citric acid in the rain water solution will yield more dramatic results.

ACTION:

FIRST DAY: Discuss the topic of monuments with the class, especially relating to existing local monuments. Show chalk, clay and other optional materials. Ask students to design a miniature monument to commemorate a person, event or idea of their choice.

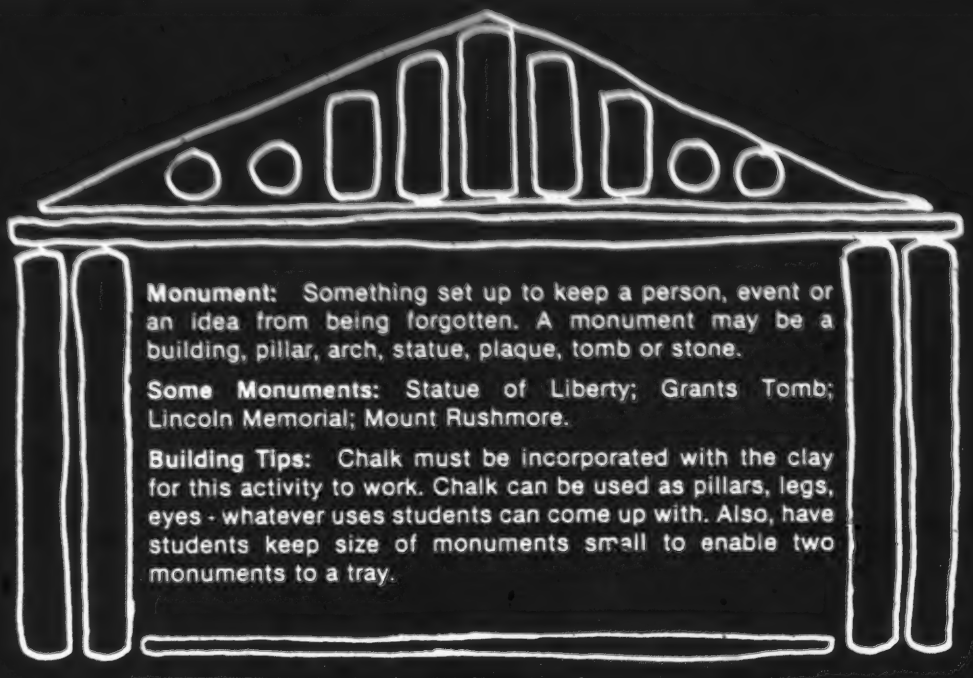
SECOND DAY: Have students build their own miniature monuments using clay and blackboard chalk. Oral presentations and/or a short creative writing assignment may be used to allow students to communicate the subject of their monuments. Allow monuments to dry or bake them in an oven at 250° F. until they dry.

THIRD DAY: Explain that many monuments are in a park-like setting. Have each team of two prepare a grassy mall using one inch of soil in the planting tray. Plant either grass or mustard seeds.

Assign teams to either "tap water" or "rain water." Have students keep a log showing the condition of their monument and the height (mm.) of their mustard and/or grass.

FOURTH--TENTH DAYS: Continue watering, observing and recording.

SEVENTH--FOURTEENTH DAYS: Wait until students notice differences between the sets of malls. Encourage them to speculate on the source of the differences. Reveal that half of the class had been watering with a solution similar to acid rain. It is now appropriate to discuss the topic.



Monument: Something set up to keep a person, event or an idea from being forgotten. A monument may be a building, pillar, arch, statue, plaque, tomb or stone.

Some Monuments: Statue of Liberty; Grants Tomb; Lincoln Memorial; Mount Rushmore.

Building Tips: Chalk must be incorporated with the clay for this activity to work. Chalk can be used as pillars, legs, eyes - whatever uses students can come up with. Also, have students keep size of monuments small to enable two monuments to a tray.

TEACH IT YOUR WAY!

Instructional opportunities and some possible extenders:

Why monuments?
Why the prevalent use of metal and stone?
What makes class made monuments attractive? scary? ugly?
What do plants need in order to grow?
How long did the seed take to germinate?
What are the origins of acid rain?
What are the effects of acid rain on automobiles? houses? drinking water? pond life?

There are international consequences of acid rain production since west to east wind patterns move acid from one locale to another, map studies might be appropriate.

Use graph to record growth differences (if any) between lawns watered with tap or acidic waters.

Observe a piece of chalk dropped into a glass of "acid rain."

Visit a local cemetery to observe weathering of grave markers.

CONCEPTS; SKILLS; VOCABULARY:

WATER WORLDS:
Acid from industrial processes becomes part of the **water cycle**, affecting animals, plants and structures.
Vocabulary: acid, precipitation, erosion, weathering, germinate.

SOCIAL STUDIES:
Monuments commemorate **persons, events** and **geographical sites.**
Vocabulary: monuments; plaque; commemorate; memorial; historical event; mall; gravestone.

ART:
Mixed media may be used to **design** and **form** a sculpted "monument."
Vocabulary: Medium; form; design; texture.

LANGUAGE ARTS:
A creative **written** or **oral presentation** communicates ideas and feelings.

MATHEMATICS:
Data collection; metric measurement.
Vocabulary: millimeter, log, graph.

MAJOR PROCESS SKILLS:
Communicating; observing; data gathering and recording; predicting; physical manipulation; valuing; forming conclusions.

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Ginger Berman, Assistant Director

WET WORLDS

MONUMENT LOG

Name _____ Type of Water _____

Day	Height of plant (mm)	How many plants (few, many)	Condition of Monument	Other Observations
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

COMING CLEAN

Written: Raymond Phorimel Design: Lucille Geary

Clean or dirty, the amount of water on earth is pretty well fixed. In nature, biological waste products and dissolving minerals dirty pure water. Unfortunately, we have accelerated this process by adding industrial pollutants to water and by using clean water to transport wastes as sewage.

Water is cleansed by nature and by people using the processes of evaporation and precipitation; sedimentation; chemical and biological treatment; and filtration. Usually combinations of these processes are used in septic tanks, sewage treatment plants and in desalination.

Without these purification processes and water reuse, we would soon run out of clean water.

CLEAN DIRTY WATER BY FILTRATION

UPPER GRADES

MATERIALS:

For each team of four:

½ gallon plastic bottle
plastic measuring cup
two clean containers (for collecting water)
window screening, cheese cloth,
or nylon net
pantyhose material
coffee filters
string
rubber bands
ruler
aluminum pie pan
eye droppers
water
soil
sand
cotton

TEACHER PREPARATION:

1. Cut the bottoms off the plastic bottles to make a large funnel capable of holding a number of layers of material.
2. Combine soil and water in a clear container and mix thoroughly.

ACTION:

Challenge students to devise a method of getting the water clean using any combination of materials furnished. Set a time limit. Provide as little additional information as possible, so as not to limit the range of creative solutions.

Note: Pupils should participate in a brief discussion of the goal: to separate the soil and water most efficiently, with the greatest amount of clean water collected by the simplest possible separator.

KEY QUESTIONS:

1. How does the separator actually work?
2. Is the final water really clean? What do we mean by "clean"?
3. What could cause your separator to stop working?
4. Could your separator remove food color or salt from water?
5. What are some separators in nature?
6. What are some separators in your home? town?

TEACH IT YOUR WAY!

Can the students see the relationship between the size of the mesh of the filtering material and the size of the material filtered out from the water?

Try adding salt or food coloring to the water.

Visit your local sewage treatment plant.

Have students determine how much pure water they dirty each day. Can they think of ways to decrease this amount?

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SHORE WORDS

Writer: Gerard Solomon, Design: Lucille Geary

SHORE WORDS

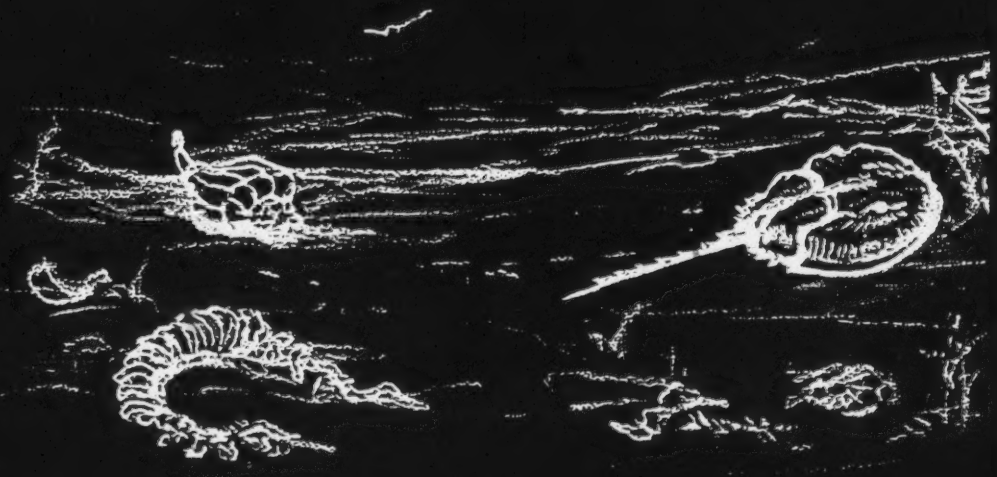
The shore is a splendid place to develop the **sensory vocabulary** of children. Whether it be lake, shore, river front or beach, opportunities for fun and learning are endless.

So - out of the classroom and to the shore!

LOWER GRADES

PROCEDURE

A treasure hunt format may be used or pupils may work in small groups or singly according to the task. To properly develop word recognititon, use the vocabulary words with individual pupils or the entire class **after** each action or observation is completed. There should be space on the student instruction card for writing, drawing, etc. You can either hand out the cards to the pupils or give oral instructions to non-readers.



OPTIONAL ACTIVITIES

Use the hand microscope to examine bits of plant material; see who can find the most unique colors and shapes.

Design a creative writing or poetry exercise.

Have students divide their vocabulary words into one, two, and three syllable words

MATERIALS

- Hand lenses
- Hand microscopes
- Large file cards

PREPARATION

Prepare the children for their trip to the shore. Make sure they dress properly and obtain parent permission slips as necessary. Extra help in the form of a parent or teacher aide is recommended.

After previewing the intended site, select suitable activities from the **action** list. Make note of the vocabulary words relevant to each action. Write each action selection on a large file card for use by the students. You may wish to add your own activites and associated vocabulary.

ACTION LIST

COLORS

LIVING THINGS

PROPERTIES OF OBJECTS

DO IT

PROCESS SKILLS & CONCEPTS

Major Process Skills: Observing, classifying, generalizing, manipulating and communicating.

Concepts: ***Water Worlds:*** Developing familiarity with the marine and/or fresh water environment.

Language Arts: Developing a descriptive vocabulary based on direct sensory interaction with a shore environment.

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SHORE WORDS ACTION LIST

COLORS

Find as many colors as possible.
Find an object with the most number of colors.
Locate two different objects that are the same color.
How many colors of sand can be found using a hand lens?

VOCABULARY

red
green
blue
yellow
orange
pink
violet
multicolored
sand
hand lens
magnifying glass
object

LIVING THINGS

Locate the largest living organism on the shore. (Remember, people are organisms).
Using a hand microscope find living organisms too small to see clearly without the microscope.

FIND:

seaweed plants.
plants that float.
plants that stick out of the water.
a living thing that moves.
a living thing that does not move.
something not alive.
animal tracks.
an organism that lives in water.
an organism that lives on the land.
an organism that was once alive.
an organism that crawls or flies.
an animal's home (shell, nest, water).

organism
plant
animal
seaweed
float
sink
living
alive
non-living
move
crawl
fly
home (house)
microscopic
small
tiny

SHORE WORDS ACTION LIST

VOCABULARY

PROPERTIES OF OBJECTS

FIND:

a non-living object.
a rough object.
a smooth object.
a hard object.
a soft object.
a cold object.
a warm object.
a heavy object.
a light object.
a dry object.
a wet or slimy object.
a sticky object.
an object that makes noise.
the prettiest and ugliest object. why are they pretty or ugly?
the tallest object at the shore.
the biggest object at the shore.
the roundest object at the shore.
foam.
an object that changed by moving water (driftwood, seashells).

object

rough smooth
hard soft
cold warm
heavy light
dry wet
sticky slimy
pretty ugly
tall short
big small
round
foam

DO IT:

Bury an Object

MAKE:

a hole in the ground that fills up with water.
a splash.
something sink.
something float.
something drift.
something bounce.
something roll.
footprints in the sand or mud

Listen:

When the class is very quiet, how many sounds can be heard? Identify the sources of the sounds. Which sounds are loud? soft?

hole
sand
splash
sink
float
drift
bounce
roll
footprints
bury
loud
soft

FISH MARKET BIOLOGY

Writer: Linda O'Diemo / *Design:* Lucille Geary

CAN'T VISIT A BEACH OR AN AQUARIUM?
TAKE A FIELD TRIP TO A LOCAL FISH MARKET!!

With increased utilization of seafood as an important source of dietary protein, first hand opportunities to learn about these animals are invaluable. The fish market is an excellent resource for class exploration. A bountiful harvest of nature is on display providing the student with rich (and sometimes tasty) experiences.

PREPARATION:

AT THE FISH STORE

Talk to the owner of a fish store in advance and plan for your class visit when the market isn't crowded. Arrange a filleting, cleaning, shucking or other suitable demonstration. While previewing the market, select from the activity list those investigations you feel are appropriate to your class. You may wish to create and add your own.

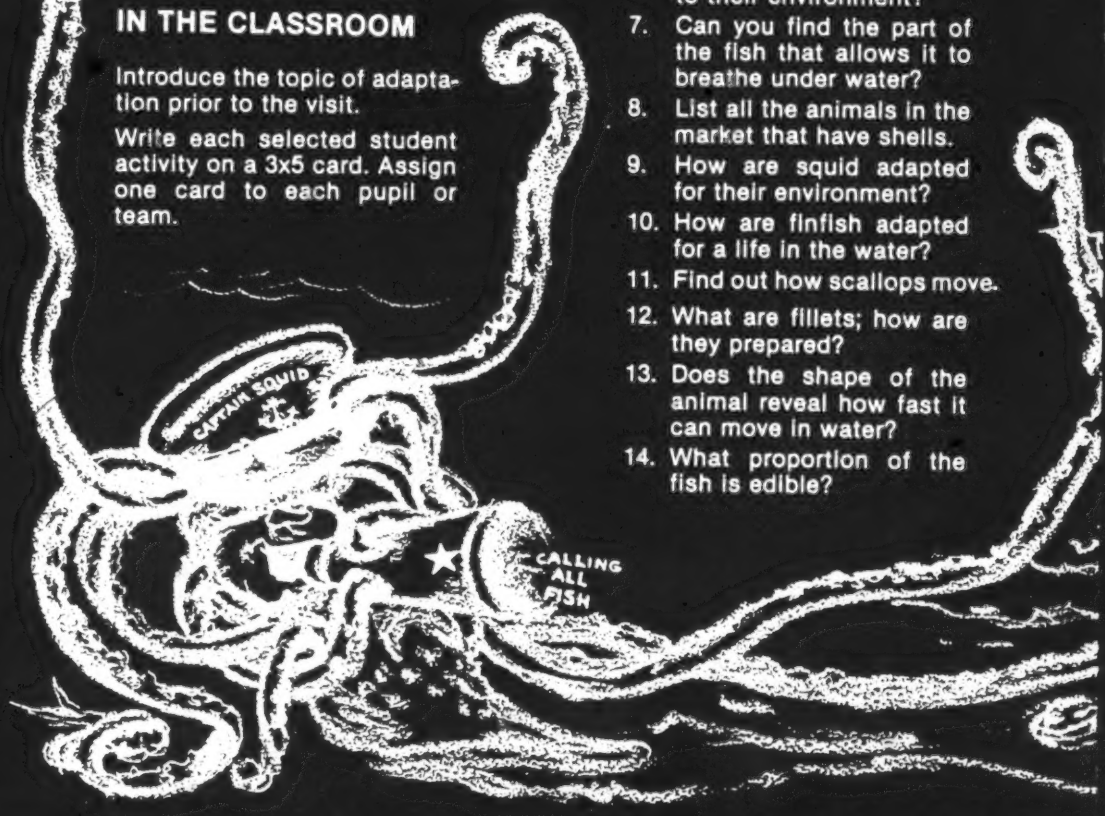
IN THE CLASSROOM

Introduce the topic of adaptation prior to the visit.

Write each selected student activity on a 3x5 card. Assign one card to each pupil or team.

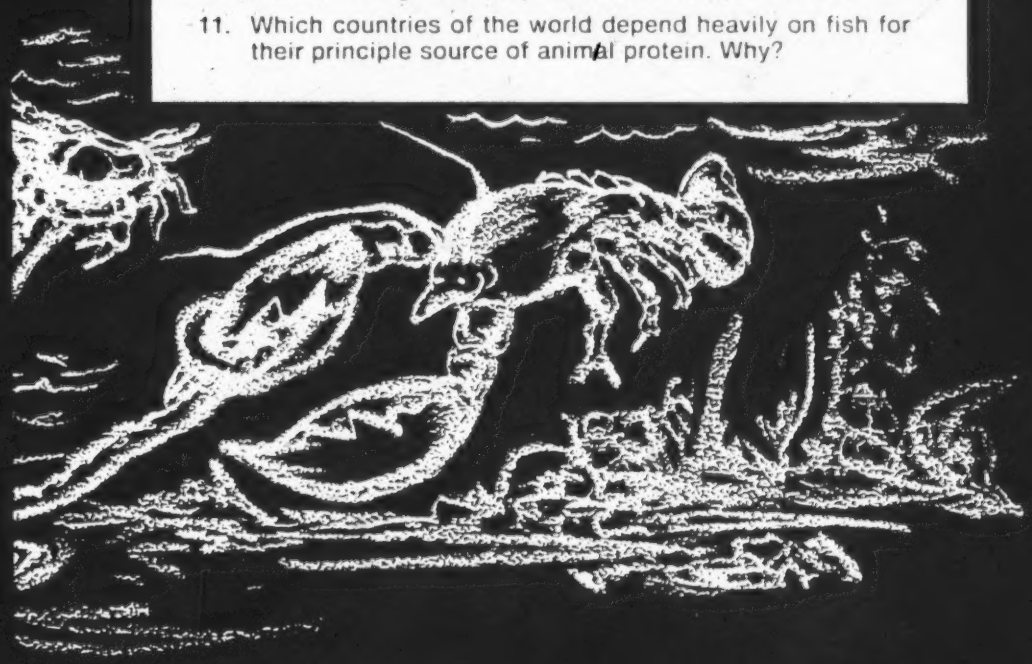
STUDENT ACTIVITIES

1. How many different types of fish are sold at the market?
2. Which fish and shellfish come from New York waters? from salt water? from fresh water?
3. How can you tell the difference between a walking crab and a swimming crab?
4. How are flounder adapted to their environment?
5. How can you tell that a fish is fresh?
6. How are mussels adapted to their environment?
7. Can you find the part of the fish that allows it to breathe under water?
8. List all the animals in the market that have shells.
9. How are squid adapted for their environment?
10. How are finfish adapted for a life in the water?
11. Find out how scallops move.
12. What are fillets; how are they prepared?
13. Does the shape of the animal reveal how fast it can move in water?
14. What proportion of the fish is edible?



TEACH IT YOUR WAY

1. Have students share their findings.
2. Have students keep a record of how often they eat fish and graph the class survey results.
3. Have students keep a record of fish prices and graph their results. Is there a relationship between the month of the year and fish prices?
4. Design a creative writing experience based on the visit.
5. Utilize the newly learned vocabulary in sentence construction.
6. Let students research commercial fishing methods; tie in national and international law governing fishing rights.
7. Take some different kinds of fish scales back to the classroom and look at them with a magnifier or low power microscope.
8. How does pollution affect the shellfish industry?
9. How does a pearl get inside an oyster?
10. After the visit have students write a thank you letter to the market telling what they saw, learned, and liked best.
11. Which countries of the world depend heavily on fish for their principle source of animal protein. Why?



OPTIONAL

Cook some squid in tomato sauce in a crock pot and have the students taste it.

Make a Japanese fish print.

If the market sells live snails, buy some and have a snail race. Place snails on a surface. Add a small puddle of india ink. Observe tracks.

Buy some squid. Have students remove the pen and the ink sack and write their name.

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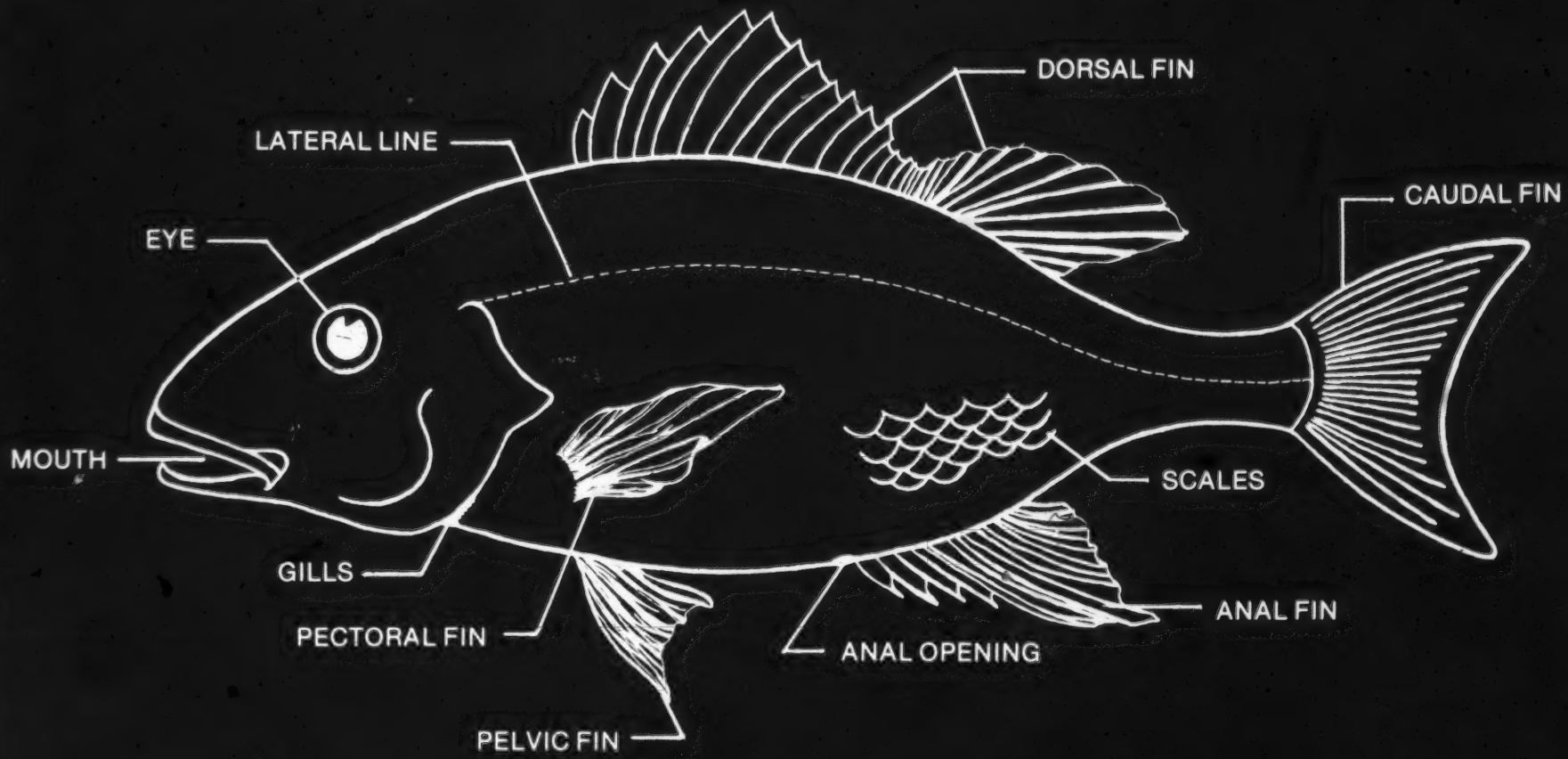

DORSAL FIN
LATERAL LINE
CAUDAL FIN
EYE
MOUTH
SCALES
GILLS
ANAL FIN
PECTORAL FIN
ANAL OPENING
PELVIC FIN

SHIP SHAPE

Writer: RUTH YARROW. Design: CYNTHIA COSTA

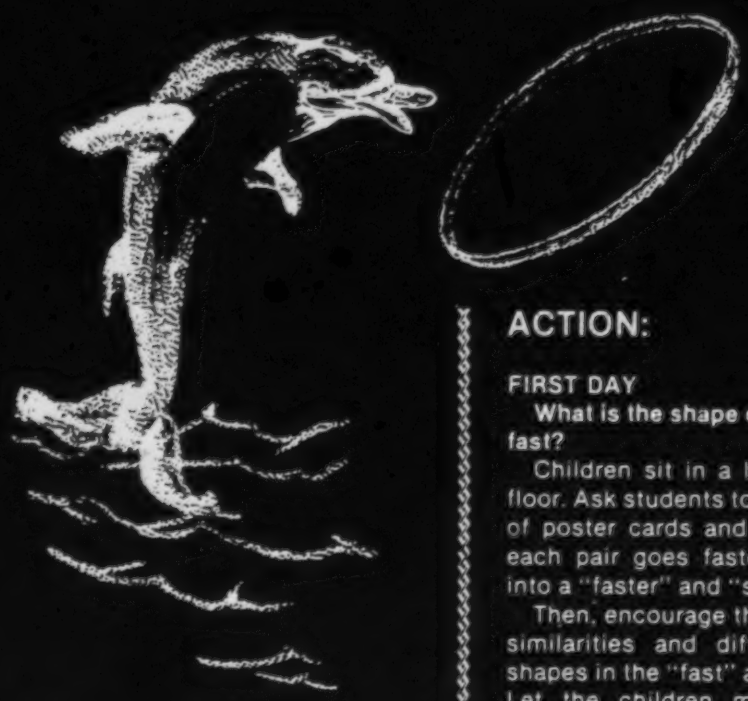
Build awareness of the geometry of familiar objects through an exploration of streamlining.

Find sets of objects with the property of rapid motion. Students look for congruence (shape match) between objects and geometric shapes.

Both living organisms and mechanical devices that move quickly through water are of a similar **streamlined teardrop shape**. This shape moves smoothly through water, causing a minimum of turbulence. **Turbulence** creates friction or "drag" which slows down the object.

The streamlined shape of aquatic animals is an important **adaptation** (a characteristic which increases an organism's chance of surviving and reproducing in its habitat). It helps them to move swiftly, find food, and to escape predators.

LOWER GRADES



MATERIALS:

DAY ONE

"Ship Shape" poster
Poster cards
thermal transparency master. circle. rectangle. teardrop. triangle.
Optional--Magazine pictures of objects and animals
Yarn

ACTION:

FIRST DAY

What is the shape of things that move fast?

Children sit in a large circle on the floor. Ask students to compare the pairs of poster cards and discuss which of each pair goes faster. Sort the cards into a "faster" and "slower" yarn circle.

Then, encourage the class to look for similarities and differences between shapes in the "fast" and "slow" groups. Let the children match the acetate geometric shapes to the poster cards to help determine shape of the faster moving objects.

DAY TWO

Make your own fast animal or thing.

Ask children to draw an animal or object that would go fast in water. Encourage them to tell the group about it. Speculate as to which animal could catch, eat, or outrun another.

Cut tear drop shapes out of construction paper. Add eyes, flippers, tails, etc. to create streamlined animals. Use these creatures to make a mobile or collage.

QUESTIONS FOR CLASS:

In these pairs of pictures, which things or animals do you think go faster?

What shapes (triangle, circle, rectangle, teardrop) do you see in any of the slow things? In the fast things?

If you were a water animal trying to sneak up on another animal to eat it, or if you were trying to escape an animal trying to eat you, how would you need to swim? What shape animal goes fastest?

Could an animal swim faster, or a boat sail faster, in smoothly flowing water or in water that is stirred up?

Can you predict which shape stirs up the water the least as it moves through--which stirs it up the most? Over which shape would water flow most smoothly? Which would splash water in different directions?

TEACH IT YOUR WAY

Using pictures of animals have students develop a food chain.

Ask children to take different shaped objects into their bathtubs with them in order to compare how smoothly each moves through water.

Have students create a story based on the relationship(s) between any of the animals or objects pictured.

If Geo-Boards are available, have students design geometric animals.

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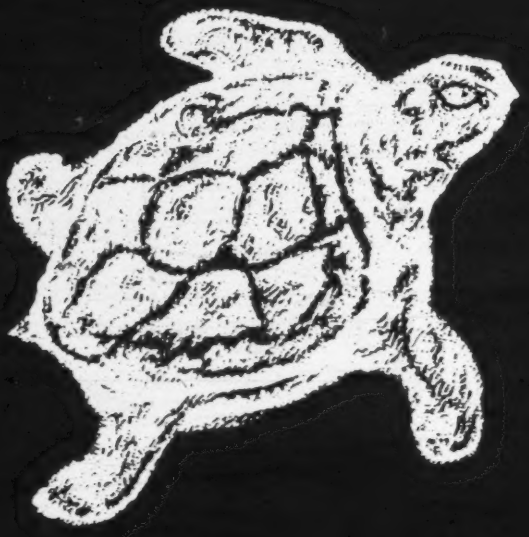
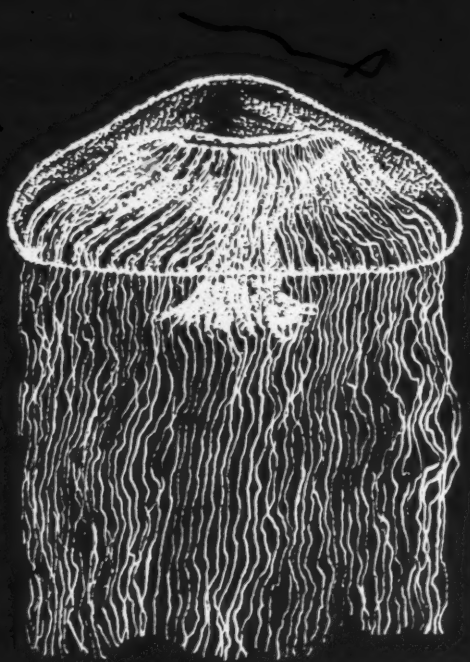
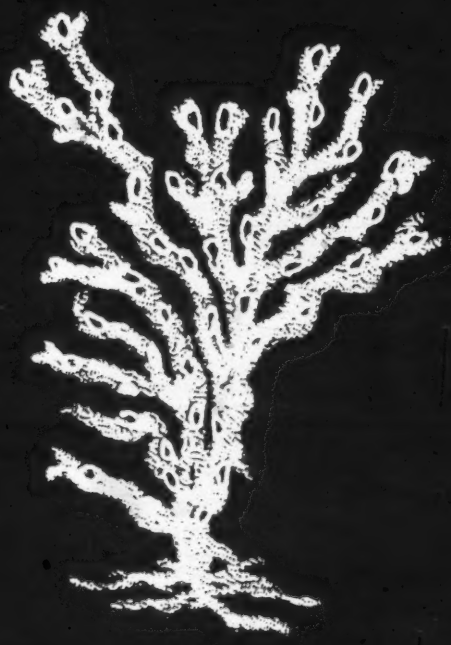
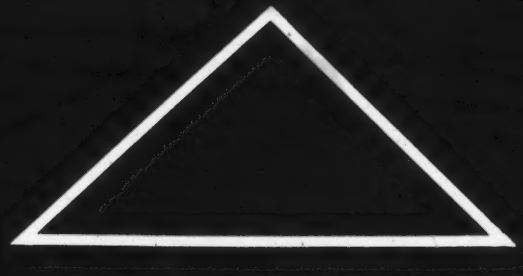
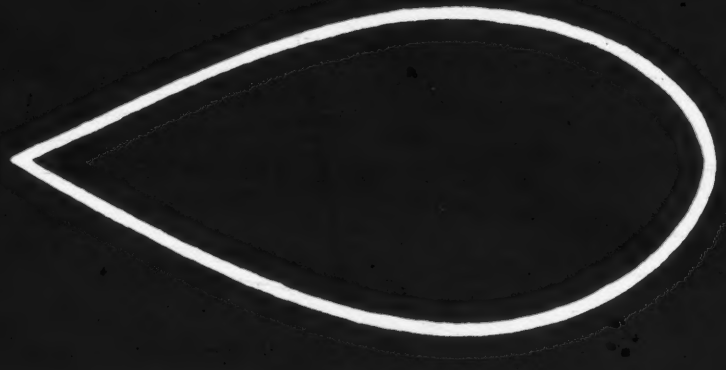




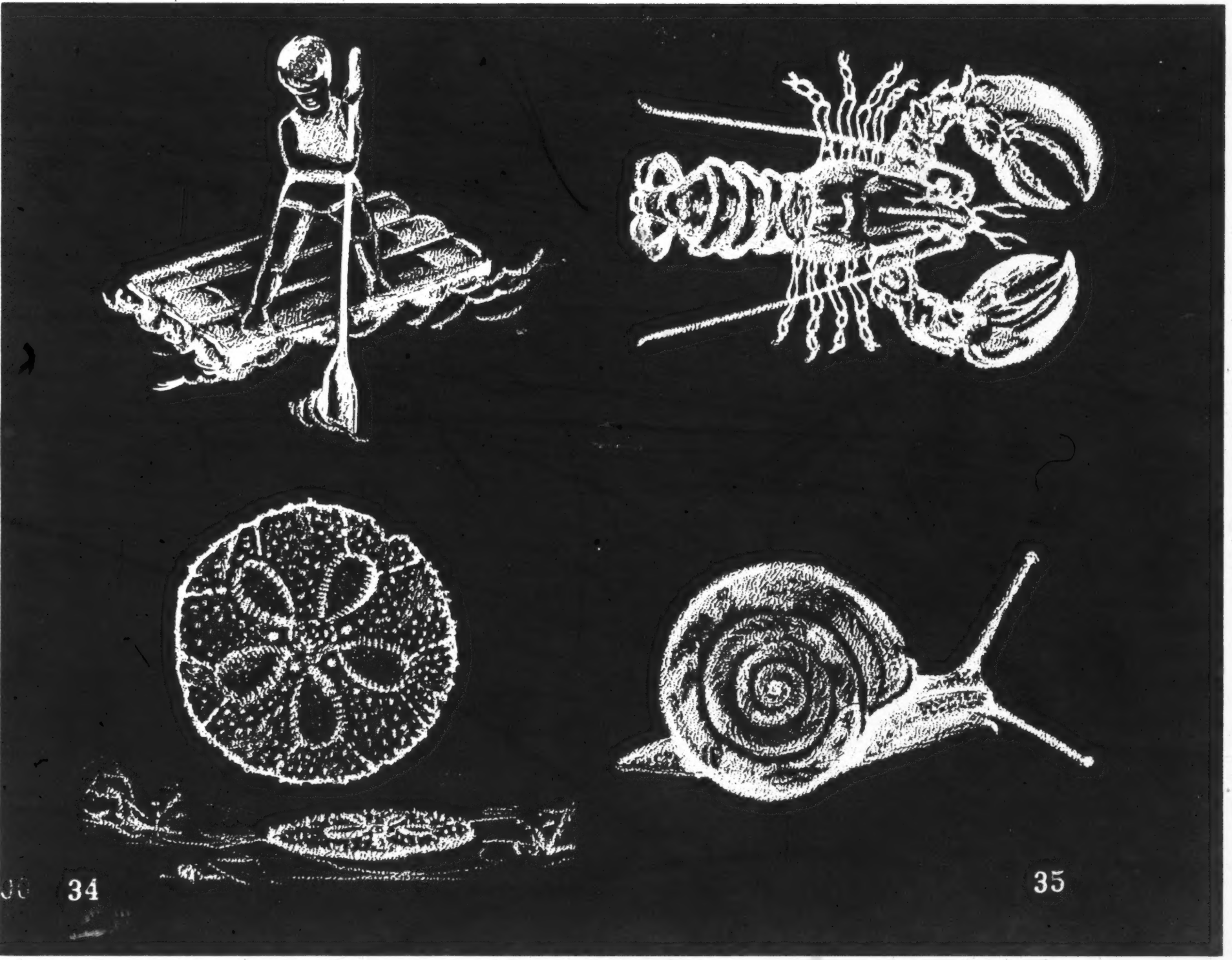






Wet Worlds

Thermal Transparency Master



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SHIPSHAPE PART II

Writer: Gerard Solomon, Design: Lucille Geary

STUDENTS EXPLORE PERFORMANCE VARIABLES AS THEY DESIGN AND TEST PAPERCLIP POWERED BOATS.

What makes one boat faster than another? Everything else being equal, the more streamlined boat will create less turbulence as it moves through water, resulting in either higher speed or decreased power requirements.

Other factors affect the speed of the boat. As the boat takes on cargo it slows down. Changes will occur as the boat is more or less submerged; as it goes from fresh to salt water; and as more power is applied.

PROCESS SKILLS & CONCEPTS

Major Process Skills: Observing, measuring, using numbers, collecting data, identifying variables, interpreting data, and manipulating.

Concepts: ***Water Worlds:*** Boat design (particularly streamlining) affects performance; salt water is more bouyant than fresh water; wind and waves affect boat speed.

Art: Design, building and decoration.

Math: Collecting and interpreting data.

UPPER GRADES

MATERIALS

Plastic planter or wallpaper pan (approximately 7" W X 32" L X 4" D) for each four students. Assorted boatmaking materials: styrofoam, wood, household discards. Grade level appropriate cutting tools (optional), plasticine clay, small paperclips, heavy sewing thread, salt, small nails, assorted small fishing weights.

PREPARATION

Provide a water pan, paper clips and general supplies for students in groups of four. Provide a means of timing (a large wall clock with a sweep second hand is ideal).

Organize teams to give each participant a chance to serve as time keeper, boat releaser and record keeper.

ACTIVITY ONE

* Set up a water pan according to the illustration and show students how the weight can pull a homemade boat through the water from one end of the pan to the other. (It is best to adjust the weight so that 8 to 15 seconds elapses).

Now challenge the students to make a boat that will outperform the demonstration boat. Require that the boat be approximately 3 - 5 inches (7.5 to 12.5 cm.) long and 1½ to 2½ inches (3.75 to 6.25 cm.) wide.

Give them a weekend to accomplish this task or alternately, provide materials for classroom boatmaking.

ACTIVITY TWO

Ask students to attach the tow line to the bow (front) of their boats. Explore the effects of different size and number of power weights on the time required to pull the boat from one end of the pan to the other.

Next have them adjust this time to about ten seconds. Then let them try pulling stern (rear) first and then port or starboard (sides) first. What happens to the speed if weights are added to the boats? Discuss results.

Do students' boats outperform the demonstration boat?

ACTIVITY THREE

Have students make waves by blowing on the water with straws, fanning with a piece of cardboard, or by using an electric fan. What happens to its speed when the boat is going into the wind and waves; when it has the wind behind it?

VARIABLES TO EXPLORE AND DISCUSS

Does the shape of the boat affect its speed?

Is there a relationship between the weight of the boat and the number of paper clips needed to power it?

Why does the boat start slowly then speed up? (overcoming inertia)

Does the degree of submersion affect the boats' performance. (More submersion, more friction)

MAKE A BIG DEAL OUT OF IT

Have the students decorate their boats. Discuss flags, then let students make and fly a flag on their boat. Can the student fashion a floating boat from clay? (See Elementary Science Study unit **Clay Boats** Webster Division McGraw Hill)

Let the students see how much cargo their boat can hold without sinking or turning over.

Compare the degree of hull submersion in fresh water to salt water. Relate this phenomenon to boats entering fresh water from the ocean or vice versa.

Take the class for a visit to local marina.

MORE CHALLENGES

Can the student design a boat that will go very slow?

. . . that will float just under the surface without sinking?

. . . that will go as fast starboard first as bow first?

. . . Have the students determine the rate of travel of their boats, either in knots or miles per hour.

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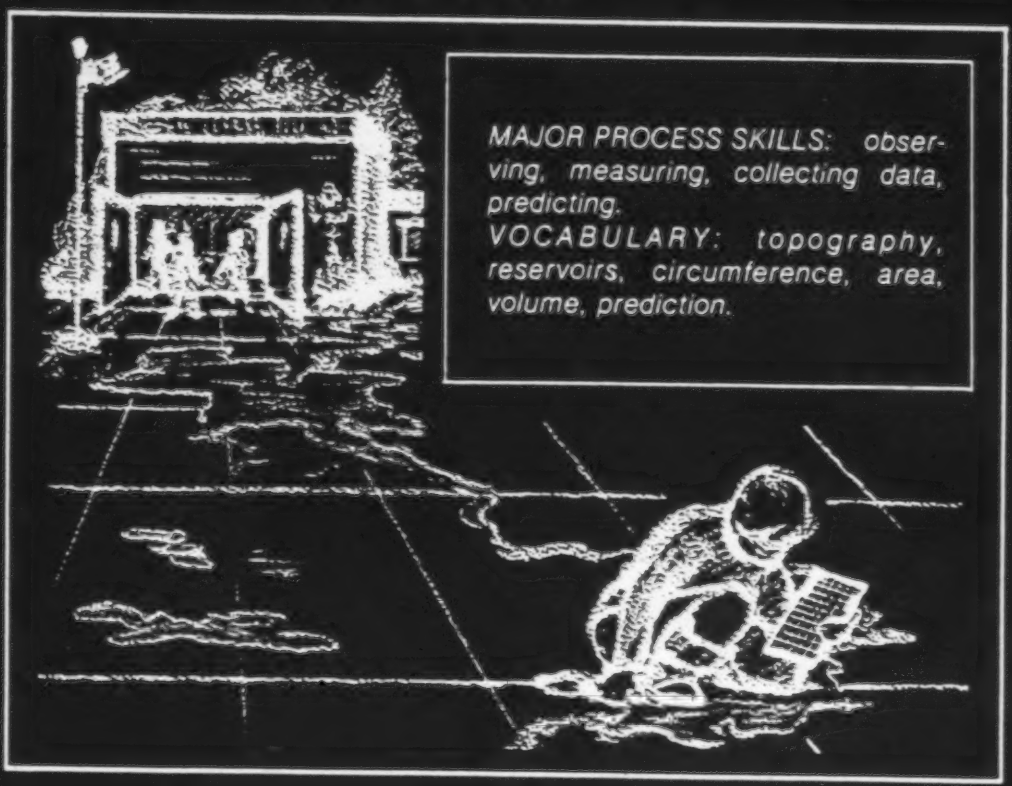
S.I. Continuum of Education
130 Stuyvesant Place
Staten Island, NY 10301
Gerard Solomon, Director
Ginger Berman, Assistant Director

PUDDLES

Writer: DOUGLAS SEAGER, Design: CYNTHIA COSTA

WHERE DO PONDS AND STREAMS FORM?

Students map their schoolyard to predict where "mini-ponds" and "mini-streams" will form.



MAJOR PROCESS SKILLS: observing, measuring, collecting data, predicting.
VOCABULARY: topography, reservoirs, circumference, area, volume, prediction.

Lakes and ponds form where there are land depressions; rain, melting snow, surface runoff, water from streams or rivers fill them. Ponds may form where there are shallow depressions in the earth's crust; lakes may form where there are deep depressions.

Puddles often form on or near the school ground after a rainfall. By becoming familiar with the landscape of the site, predictions can be made as to where "mini-lakes", "mini-streams" and "mini-ponds" will form.

UPPER GRADES

TEACHER PREPARATION:

This activity requires two visits to the same site, once when the area is dry and once soon after a heavy rainfall when the area is very wet. It is advisable to preview an appropriate site before and after a rainfall prior to beginning the class activity.

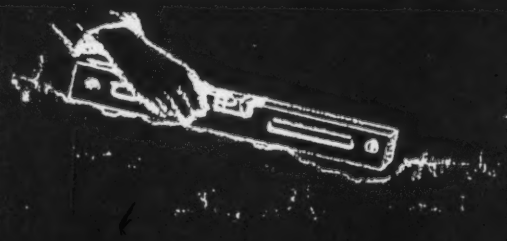
MATERIALS:

(Dry site visit)

- Rulers
- Meter sticks
- Graph paper or sketching paper
- Carpenter's level
- Camera (optional for "pre" and "post" records of the site)

(Wet site visit)

- Ball of string
- Meter sticks
- Pails
- Ping Pong balls, popcorn or pieces of styrofoam
- Watch with secondhand or stopwatch
- Graph paper
- Rain boots
- Camera (optional)



ACTION:

DRY SITE VISIT--

Students draw a map of the site and mark high areas, low areas, and landmarks (e.g. flagpole). Based on their observations, students predict where "ponds", "lakes" and "streams" will form. Using a carpenter's level to determine the direction of the slope of the land will help develop predicting skills.

Key Questions:

1. Can you guess where puddles will form the next time it rains?
2. How many puddles will there be on the selected site?
3. Where will the first puddle be?
4. Where will the largest puddle be?
5. Will any puddles form on nearby sidewalks?
6. Where will the most inconvenient puddle form?

WET SITE VISIT--

Students check their predictions (using their maps) with the actual conditions they find. They should draw puddles and any connecting "streams" on original map (use arrows to show direction of stream flow). Label all features shown.

Key Questions:

1. Do any puddles continue to fill in after the rain has stopped?
2. Can you see any " mini-streams" flowing into one of the puddles , helping to fill it?
3. Do any of the puddles overflow? Can you follow the stream path away from one of the puddles?
4. Can you predict which puddle will empty or "dry up" first? Which will be last? Mark the puddles and see how well you predicted.
5. Is the puddle water clear or dirty? What do you think the bottom of the puddle will look like after the water has dried up?

OPTIONAL ACTIVITY:

MEASURING PUDDLES--

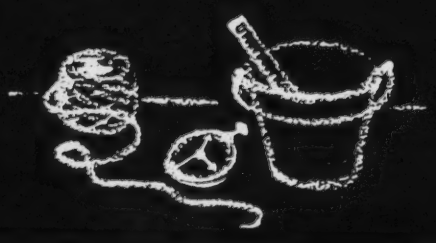
Divide the class into small groups and try to solve one of these problems:

- How can the amount of water in a puddle be measured?
- How can the rate of flow be measured in a "mini-stream"?

Hints: Depth and circumference measurements can be done with a ruler and string.The volume of water can be roughly estimated by a spongefull, cupfull, or pailsfull method.

By marking off 5, 10, or 50 meter lengths (depending on the length of the stream that has formed) and timing how long it takes a ping pong ball (or popcorn, styrofoam, etc.) to travel the measured distance, the rate of flow of the stream may be measured.

After returning to the classroom, students may discuss ways to improve their measurement methods.



TEACH IT YOUR WAY!

Discuss the formation and disappearance of ponds and puddles.

Use the information obtained by the groups that measured water volume in one pond to estimate the amount of water that fell on the entire site.

Find the degree of incline using a carpenter's level and protractor.

Discuss measuring techniques and methods of estimating large samples.

Discuss similarities and differences between real lakes and streams and the "mini" lakes and streams in this activity.

What are some uses of running water?

Creating reservoirs: Where are dams built? Why?

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Gerard Solomon, Director

EVERY LITTLE DROP COUNTS

Writer: Ginger Berman, Design: Lucille Geary

STUDENTS UTILIZE MATH SKILLS TO EVALUATE WATER USAGE AT HOME, AT SCHOOL, AND IN THEIR TOWN.

The severe water shortages experienced in New York State, as well as other parts of the United States and the world have caused a reassessment of the way water is used. The time has come to think before turning the tap.

By examining and quantifying the amount of water personally used during the day and considering the millions of others using similar amounts, concern for water conservation may be encouraged.

PROCESS SKILLS & CONCEPTS

Major Process Skills: Collecting data, interpreting data, measuring, observing, using numbers.

Concepts: ***Water Worlds:*** Awareness of water resources and the role of the student and community in conserving these resources.

Math: Collecting and interpreting data, measuring, averaging and tabulating.

MATERIALS

Water Use Chart
EPA* Water Wheels *from U.S. Environmental Protection Agency

ACTION

I. How much water is used at home?

a. Using the Water Use Chart, ask students to quantify the amount of water they personally use each day. Similarly, have them chart the amount of water used by their entire family. Encourage the students to involve their families in this project.

b. In class, average the amount of water used by students and families. Then, extrapolate average family water usage to town usage (Chamber of Commerce or town officials can supply census figures).

II. Water Conservation: How much water can you save?

Now that the members of the class have determined how much water they use, discuss conservation methods. As part of this discussion you may wish to hand out the EPA water wheels, shower restrictors or teacher selected materials.

After implementing water conservation measures, students should redo their Water Use Charts and compare their results with their initial survey. [Be sure to ask students to take their second survey on the same day of the week to minimize the effects of this variable.]

CLASS QUESTIONS

1. What is the relationship between size of family and total water used?
2. How much of the water that is used is really necessary?
3. Which of your activities at home/at school uses the most water?
4. Which conservation measure saves the most water?
5. What measures can your school take to conserve water?
6. Do you think there should be fines for wasting water? How would you put these into effect?
7. Is more water used on one day of the week than another?

OPTIONAL ACTIVITIES

1. Find a leaky faucet and measure how much water is wasted over a given period of time. To find out, collect water with a gallon jug or eight ounce glass. Students may then compute the amount of water lost per day and per year.
2. Do students use more water at school than at home? Find out!

TEACH IT YOUR WAY

What have people done to survive droughts throughout history?

The handling of the recent drought by Marin County, California provides a good example of community action to conserve water. New York State has just past through a less difficult water shortage. Students can write to their local officials to find out what steps your community is prepared to take in the event of a severe water shortage.

One thousand (1,000) gallons of water flow from an open fire hydrant per minute. Can students determine how much water is wasted per day?

Ask students to bring in their home water bill. Using the information found on the bill, have students compute the cost of their personal usage.

How does the availability of water affect the way people live in different countries?

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WET WORLDS

Date _____

Day of Week _____

HOME WATER USE CHART

_____

(Name of student or family)

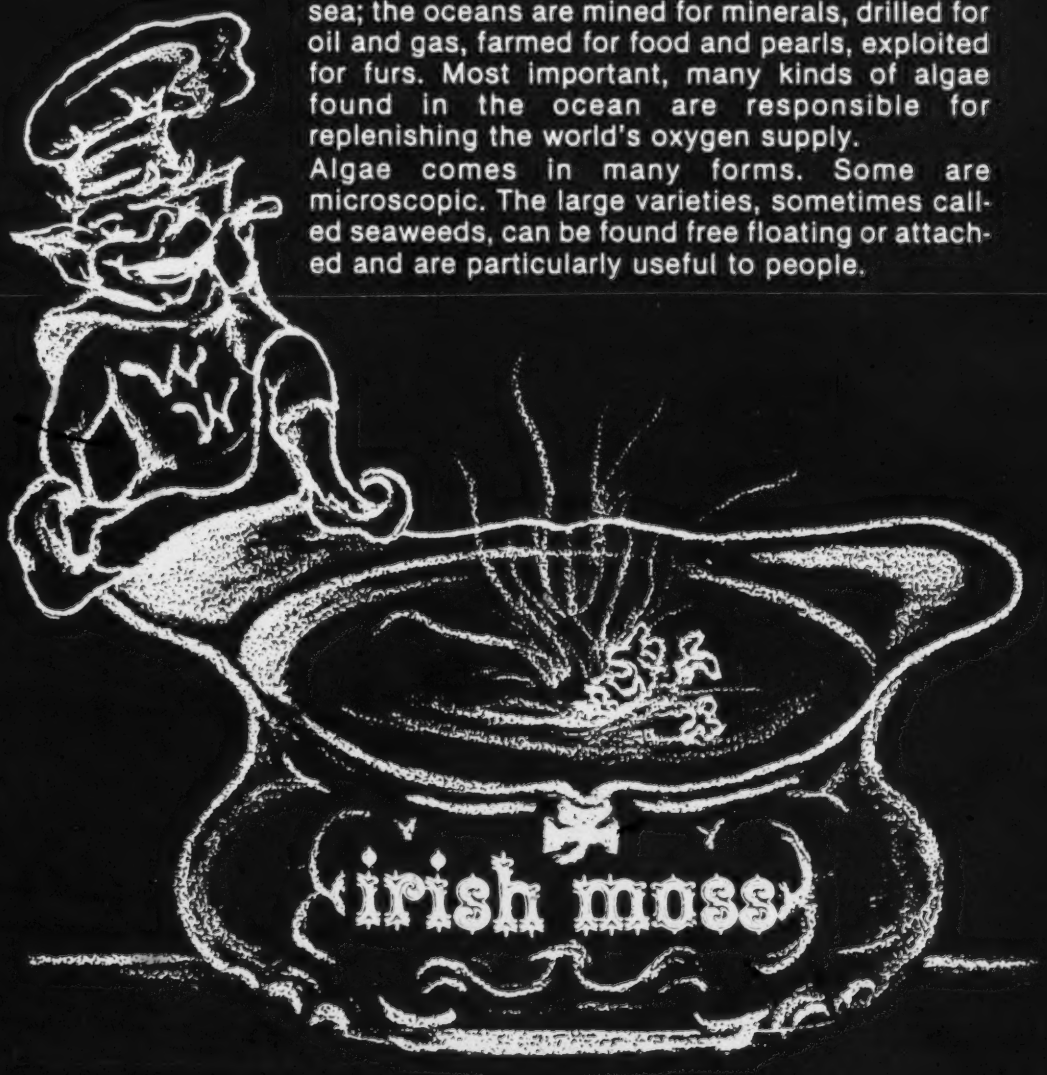
Water is used for	Amount of water used	Times/Day	Total
Toilet Flushing	5 - 7 gallons		
Shower	5 - 10 gallons/minute		
Tub Bath	50 gallons		
Sink Faucet	3 - 5 gallons/minute		
Dishwasher	15 - 25 gallons		
Washing Machine	35 gallons		
Washing Car	5 - 10 gallons		
Lawn & Garden Watering	35 gallons/½ acre		
Watering House Plants			
Drinking Water			
Cooking			
Mopping Floors			
Filling swimming pool			
Other			
		Grand Total	_____

GREEN GOOK

Writer: Bernice Bunny Nadelman *Design: Lucille Geary*

The ocean provides many useful resources: Much of the world's food supply depends on the sea; the oceans are mined for minerals, drilled for oil and gas, farmed for food and pearls, exploited for furs. Most important, many kinds of algae found in the ocean are responsible for replenishing the world's oxygen supply.

Algae comes in many forms. Some are microscopic. The large varieties, sometimes called seaweeds, can be found free floating or attached and are particularly useful to people.



STUDENTS PREPARE IRISH MOSS SEAWEED EXTRACT. DISCOVER IT'S PROPERTIES AND CREATE USES.

MATERIALS:

Algae Extract (Carrageenan) Preparation

Stove or Hot Plate
2 liters of fresh Irish moss or
4 oz. of packaged dried Irish moss
4 qt. pot
Colander
Mixing Spoon
Water
Various containers
Package Handi-wipes

For Each Team of Three Students

250 ml (8 0z.) class prepared green gook
Paper plate tray or newspaper
1 eye dropper
3 plastic spoons
Sampling of exploratory ingredients:
1 uncooked cluster of Irish moss
Baby food jar caps,food coloring, orange juice concentrate, salt, cornstarch, milk, other materials

PREPARATION

Collect several liters of fresh Irish moss from a beach or purchase 4 oz. of packaged dried moss from a health food store or oriental grocery. (Fresh Irish Moss may be freezer stored in small individual plastic bags.)

Before introducing Irish moss to class, initiate a discussion on food and other resources from the sea.

ACTION:

Extracting Carrageenan
(Green Gook)

1. Have students wash Irish moss thoroughly in a colander under cold running water to remove all sand and salt water.
2. Have class observe color change of re-hydrated moss.
3. Place in pot, cover with water and bring to a boil.
4. Gently boil for eight minutes, stirring occasionally with spoon.
5. Cool the mixture and pick out undissolved fronds or strain through handi-wipes.
6. Distribute cups of the boiled moss gook to teams for their observation along with uncooked seaweed for comparison.
7. Give students the property comparison sheet and supplies.
8. Encourage students to taste the gook. It's harmless and found in many products they eat. (Reaction to this request is generally humorous).
9. Based upon the properties found ask for possible uses for the substance. Encourage diversity by indentifying the most funniest, most ridiculous, practical "I can't believe I thought of this idea."
10. Help students test as many of their ideas as possible.

About Irish Moss

Irish moss - Chondrus crispus

Member of red algae family

Growth size 2 - 6 inches

Found in dense masses in tidal pools and the lower intertidal zone and below.

Clings to rock similiar in a hand grip fashion called a holdfast.

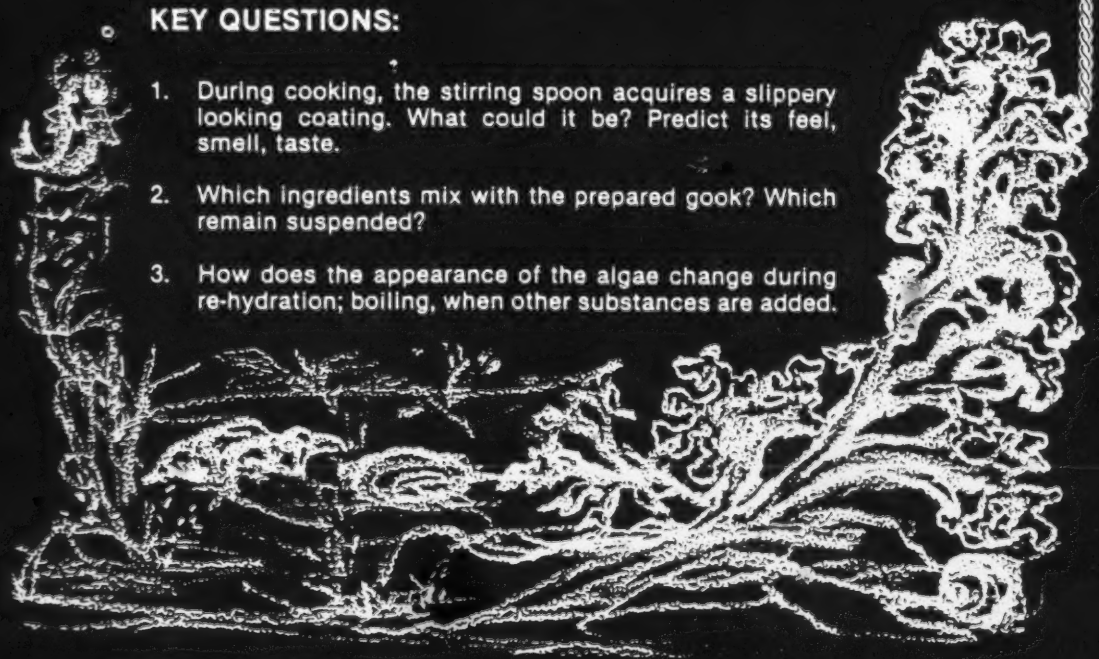
Used as a food as well as a source for chemicals for industry.

The extract of red algae is called carrageenan and is a gelatin substance frequently used as a stabilizer, emulsifier, or thickener; provides texture and body to foods and products.

Due to its usefulness Irish moss is aquafarmed and if gathered correctly, is a reuseable resource.

KEY QUESTIONS:

1. During cooking, the stirring spoon acquires a slippery looking coating. What could it be? Predict its feel, smell, taste.
2. Which ingredients mix with the prepared gook? Which remain suspended?
3. How does the appearance of the algae change during re-hydration; boiling, when other substances are added.



TEACH IT YOUR WAY

1. Investigate super-market and drug store for products using algae extracts as an ingredient. (Read labels.....ask questions)
2. Find out which country uses the most algae as a food? Why do you think this might be necessary?
3. Identify, name and dry preserve seaweed.
4. Collect and share recipes using seaweed.
5. What products are made with carrageenan?
6. What other algaes are useful?
7. Explore the historical use of seaweed.
8. What do you think the future of seaweed will be?
9. If students have invented new products, encourage them to design the packaging, and decide on a selling price and marketing strategy. What part of the country would find the product most useful. Have the students write slogans and TV commericials for advertising their products.

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EXPLORING CARRAGEENAN

COMPARISON OF PROPERTIES	WATER	IRISH MOSS EXTRACT
Color		
Taste		
Odor		
Feel		
Flow		
Shape of drop on waxed paper		
Slipperyness		
Stickiness		

MIXING

Find out which common substances will mix with gook? Add small amounts.

SUBSTANCE ADDED	RESULT
Salt	
Oil	
Water	
Starch or flour	
Milk	
Orange Juice Concentrate	
Food Coloring	

CREATE A USE

With your team members, invent a new use for your green gook. Consult with your teacher to see if the needed materials are available.

Did your idea work?

OIL SPILL

Writers: Adapted From Texas A&M Sea Grant Project *Design: Lucille Geary*

✻ BRING THE PROBLEMS OF AN OIL SPILL INTO THE CLASSROOM

OIL SPILL

STUDENTS LOAD OIL INTO THEIR SUPERTANKERS AND HEAD FOR NEW YORK--THEN OIL SPILL!! *OIL SPILL* MAKES PUPILS AWARE OF THE SOURCES, TRANSPORTATION AND HAZARDS SURROUNDING THE IMPORTATION OF FOREIGN OIL.

One of the consequences of the increased supertanker transportation of oil from South America and the Arab states is an increase in oil spills. The spills are damaging ocean fishing grounds, spoiling beaches and destroying shellfish industries. Offshore drilling also raises this peril. The economic and environmental costs of these spills are great. Further, establishing responsibility for cleanup and damages is often difficult. Students should be aware of the sources of world oil, the practice of ocean transportation to the United States, and the ramifications of oil spills from these transports.

MATERIALS

Effectiveness Chart
paper cupcake cups,
Bottom halves of gallon plastic milk containers, Arco graphite motor oil,
Pipe cleaners
Eye droppers

Oil spill clean-up materials: cotton balls; pieces of nylon stockings; string; cloth; plastic spoons; pieces of plastic sponge; paper towels; aluminum foil; pieces of styrofoam cups; pieces of brown paper bag; wood shavings; plastic wrap, coffee filters; dip nets; other materials as available.

STUDENT PREPARATION

Students should dress as they would when using paint materials.

TEACHER PREPARATION

For each group of four students: a small amount of oil in a plastic cup; eye dropper; pipe cleaners; cupcake cup; oil spill cleanup materials; a milk container bottom partially filled with water.

ACTION

Briefly discuss transportation of crude oil from foreign sources.

Introduce pupil to their "shore".

Have pupils populate the shore of the "ocean" (plastic containers) with pipe cleaner shore birds of their own design. Hang the birds on the edges of the container.

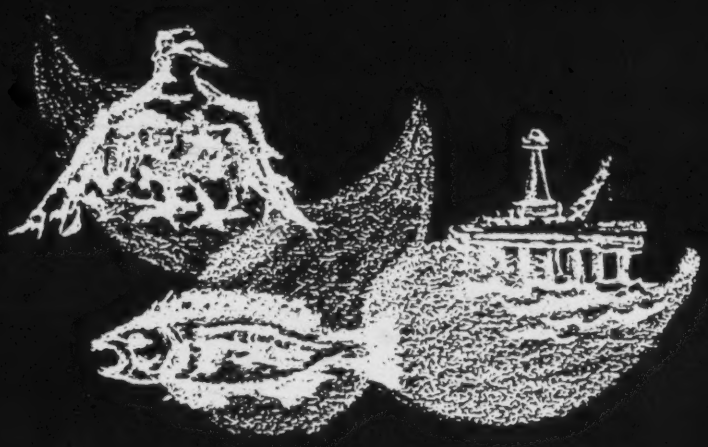
Cargo Loading Having students fill their "supertanker" cupcake cup with 20 drops of oil.

Oil Spill!! Oil spills can occur through collision, leaks or capsizing. Students will easily design their own spill disaster.

After The Spill Students might create "storm" conditions by fanning or blowing on their ocean, or by rocking their containers.

Clean-Up- Using the available materials, students should clean up their ocean, shore and shore birds.

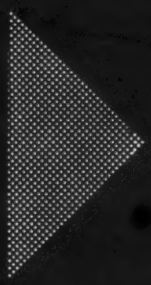
Encourage the students to clean up carefully so that they may assess which clean-up materials work best. The *Effectiveness Chart* provided should be used to help them determine the best method.



KEY QUESTIONS:

1. Which clean-up materials worked best?
2. What's the difference in cleaning up your "ocean" when the conditions are calm and when they are stormy?
3. What happens to the oil when conditions are stormy?
4. Is there any way a spill can be contained (kept in one area, and away from shore)?
5. What happens when an oil spill is not cleaned up?
6. Can any oil be recovered from the clean-up materials?
7. How do you suppose ocean spills are actually cleaned up?
8. When supertankers spill oil, who should be responsible for the oil clean-up?
9. What is the effect of oil spills on the general environment? On marine life?
10. How do oil spills effect the fishing industry?

TEACH IT YOUR WAY



Explore the role of oil in our daily lives: heating, generation of electricity; petroleum derrivitives (plastics, drugs, dyes, synthetic fabrics).

Explore alternate forms of energy: solar, atomic, natural gas, coal.

How do oil needs help shape foreign policy?

OPTIONAL

Does water temperature affect the ability to clean up the oil spill? Try using hot, lukewarm and cold water to find out.

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WET WORLDS

CLEAN-UP EFFECTIVENESS CHART

Name _____

KEY

4 = Most effective

3 = Effective

2 = Moderately effective

1 = Slightly effective

0 = Not effective

MATERIAL	RATING
Cotton balls	
Nylon stocking	

THE WET WORLDS ICOSAHEDRON

The icosahedron mobile was designed to accompany and illustrate the varied Wet Worlds Activities. Construction of the Wet Worlds icosahedron (a geodesic sphere of 20 equilateral sections) will present a challenge in creativity and dexterity to your enterprising young students. Many of the triads (the component section with 3 equilateral edges) may be decorated with a variety of materials, thus enabling the pupils to construct a very unique mobile for their classroom. The assembly is a simple operation. There are 3 main components to build: the top cone consisting of 5 triads; the center section consisting of 10 alternating triads; and the bottom cone consisting of 5 triads;

ASSEMBLY

After the 5 triads of the top cone are glued or stapled together, repeat this process for bottom cone. (Drawing A and C.) Now glue the center section as one continuous band consisting of 10 alternating triads. (Drawing B) Complete your geodesic sphere by gluing bottom flaps of top cone to top flaps of center section; then glue the bottom flaps of center section to top flaps of bottom cone.

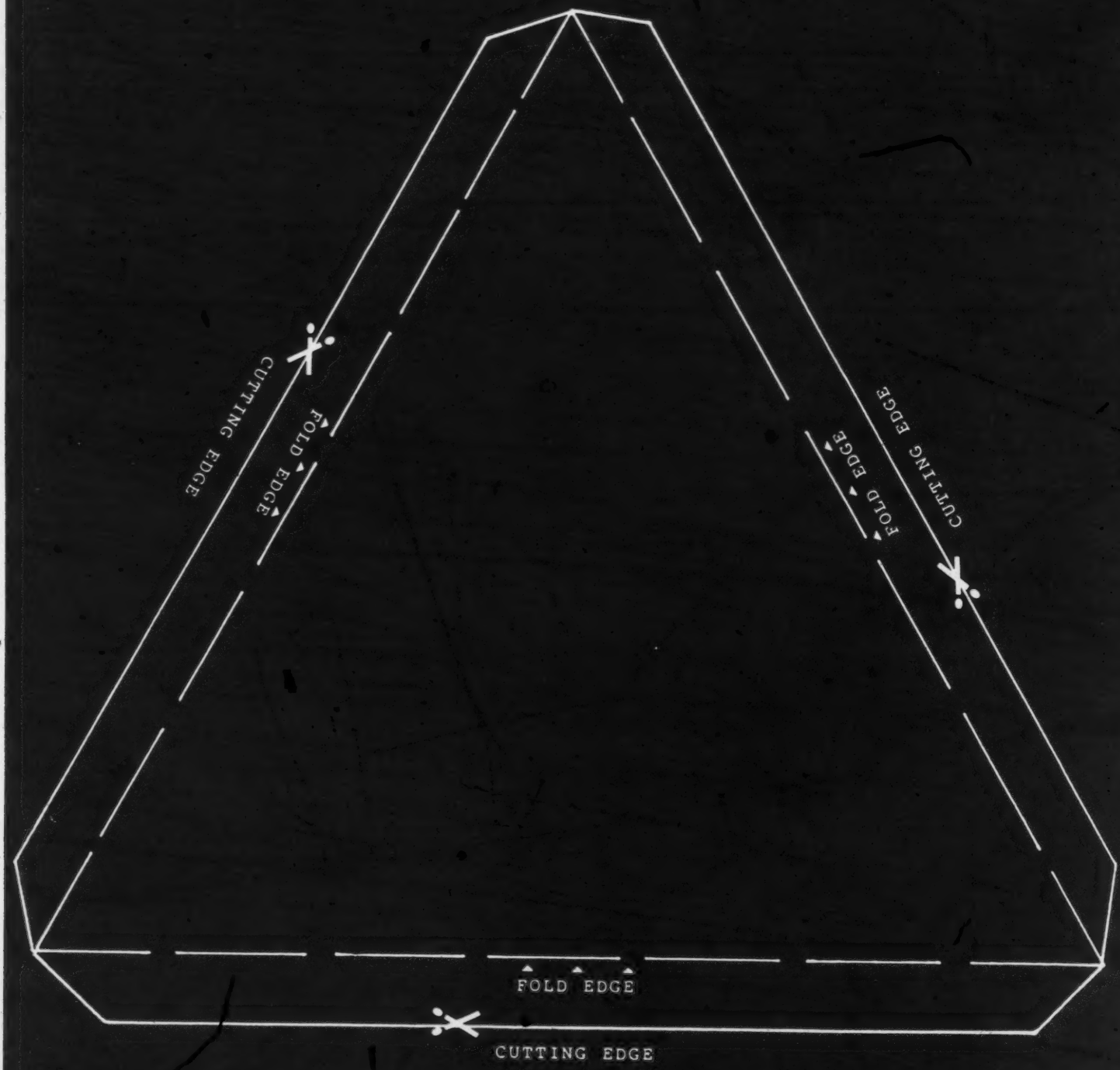
Your icosahedron may now become a mobile by attaching a string to the top of the unit. Some blank sides of this mobile may be made transparent by using overhead transparency acetate. This allows a view of an interior mobile, or hanging object of unique design - a visual experience in itself. A tactile surface is another variable. In fact, the creativity opportunities of this sphere are both limitless and timely!

Drawing A

Drawing B

Drawing C

CUTTING EDGE
FOLD EDGE
PUDDLES
CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE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CUTTING EDGE
GREEN GOOK
FOLD EDGE
CUTTING EDGE

CUTTING EDGE
FOLD EDGE
CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE

CUTTING EDGE

FOLD EDGE

MONUMENTAL PROBLEMS

CUTTING EDGE

FOLD EDGE

FOLD EDGE

CUTTING EDGE

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CUTTING EDGE

CUTTING EDGE
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WET
WORLDS
CUTTING EDGE
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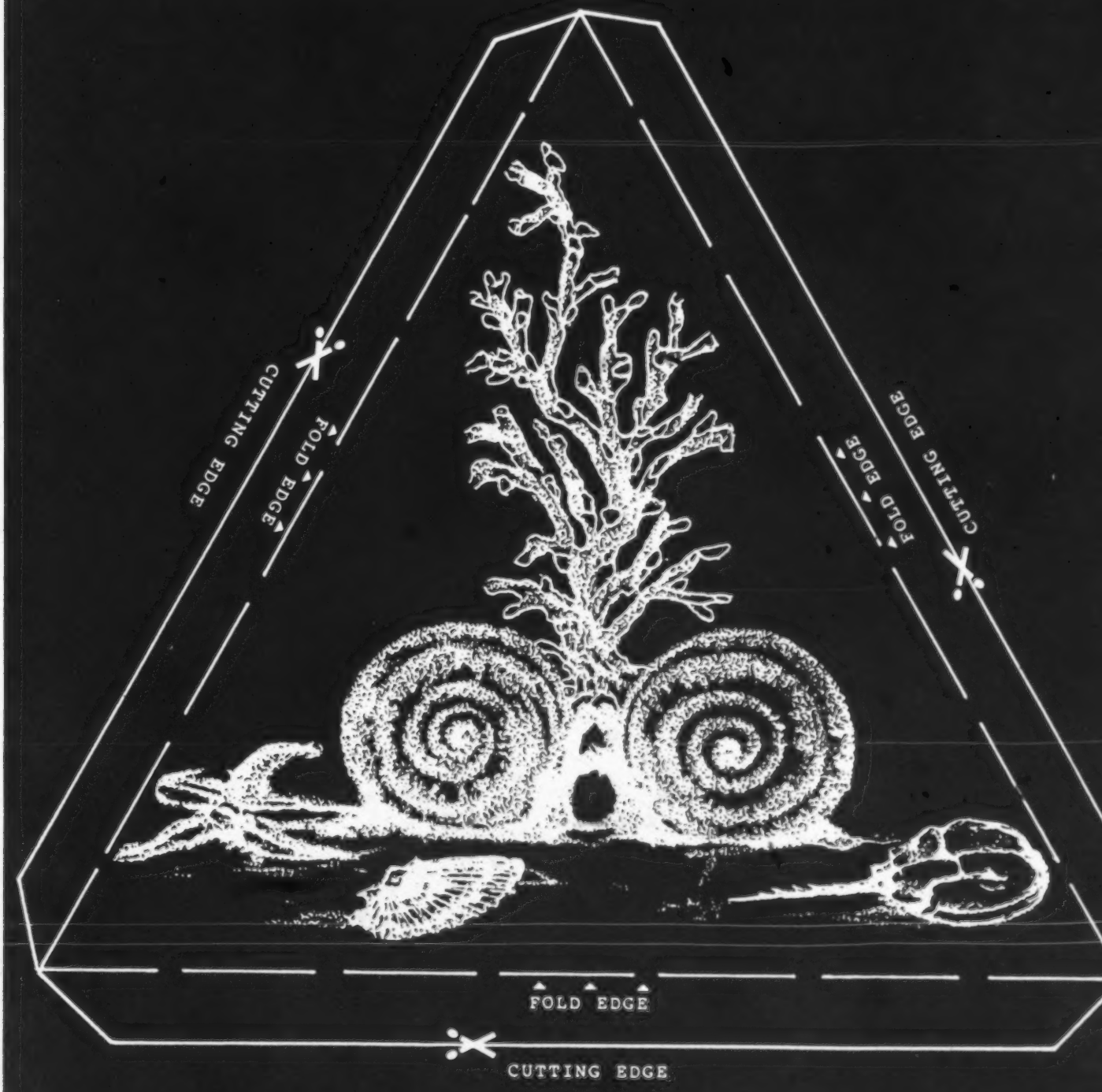
CUT OUT
CIRCLE
FOLD EDGE
CUTTING EDGE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CUTTING EDGE

SHORE
WORDS
CUTTING EDGE
FOLD EDGE
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CUTTING EDGE
FOLD EDGE
CUTTING EDGE

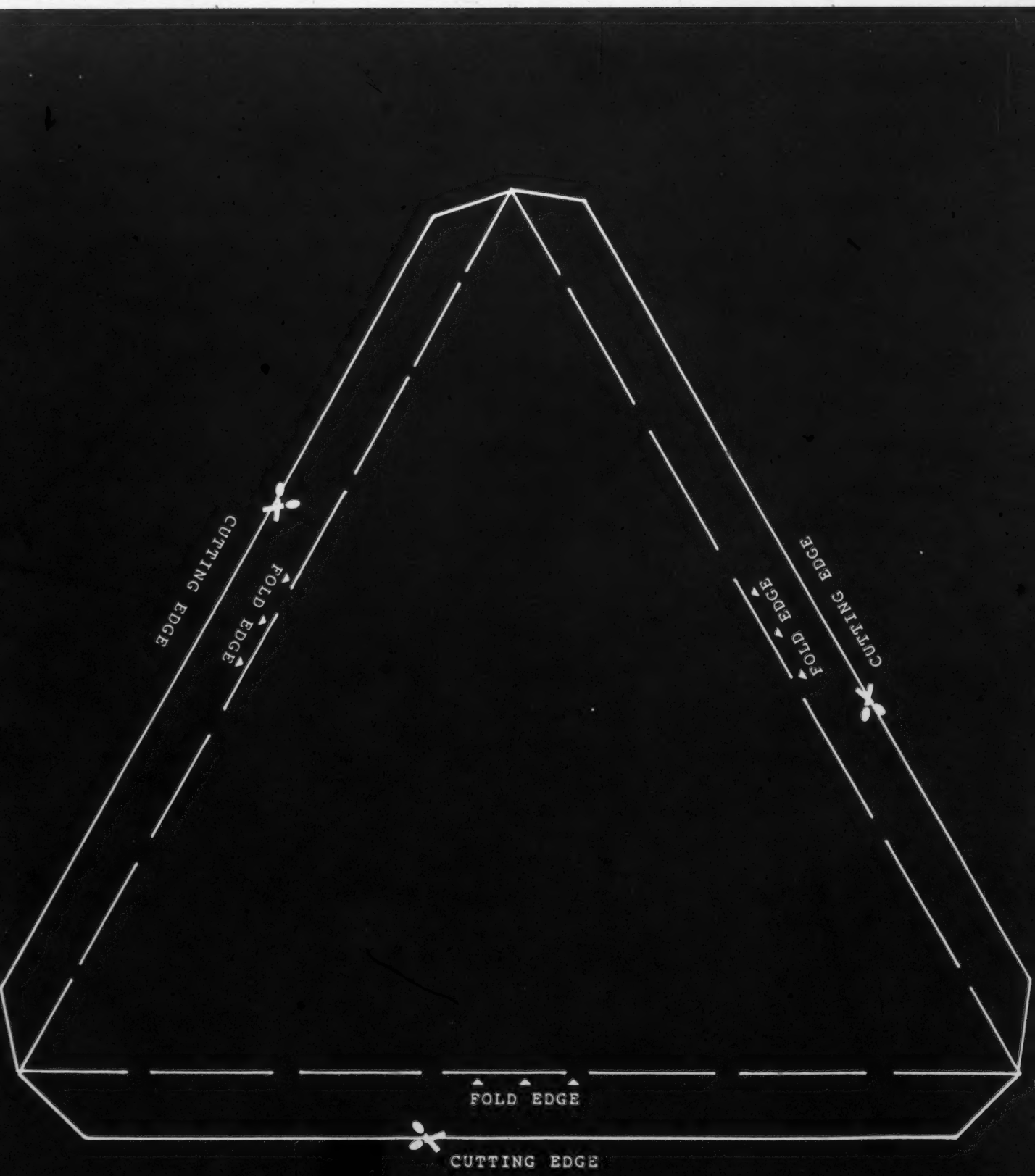
CUTTING EDGE

FOLD EDGE

EVERY LITTLE DROP COUNTS

CUTTING EDGE
FOLD EDGE
CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE

CUTTING EDGE
FOLD EDGE
OIL SPILL
CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE


CUTTING EDGE
FOLD EDGE
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CUTTING EDGE
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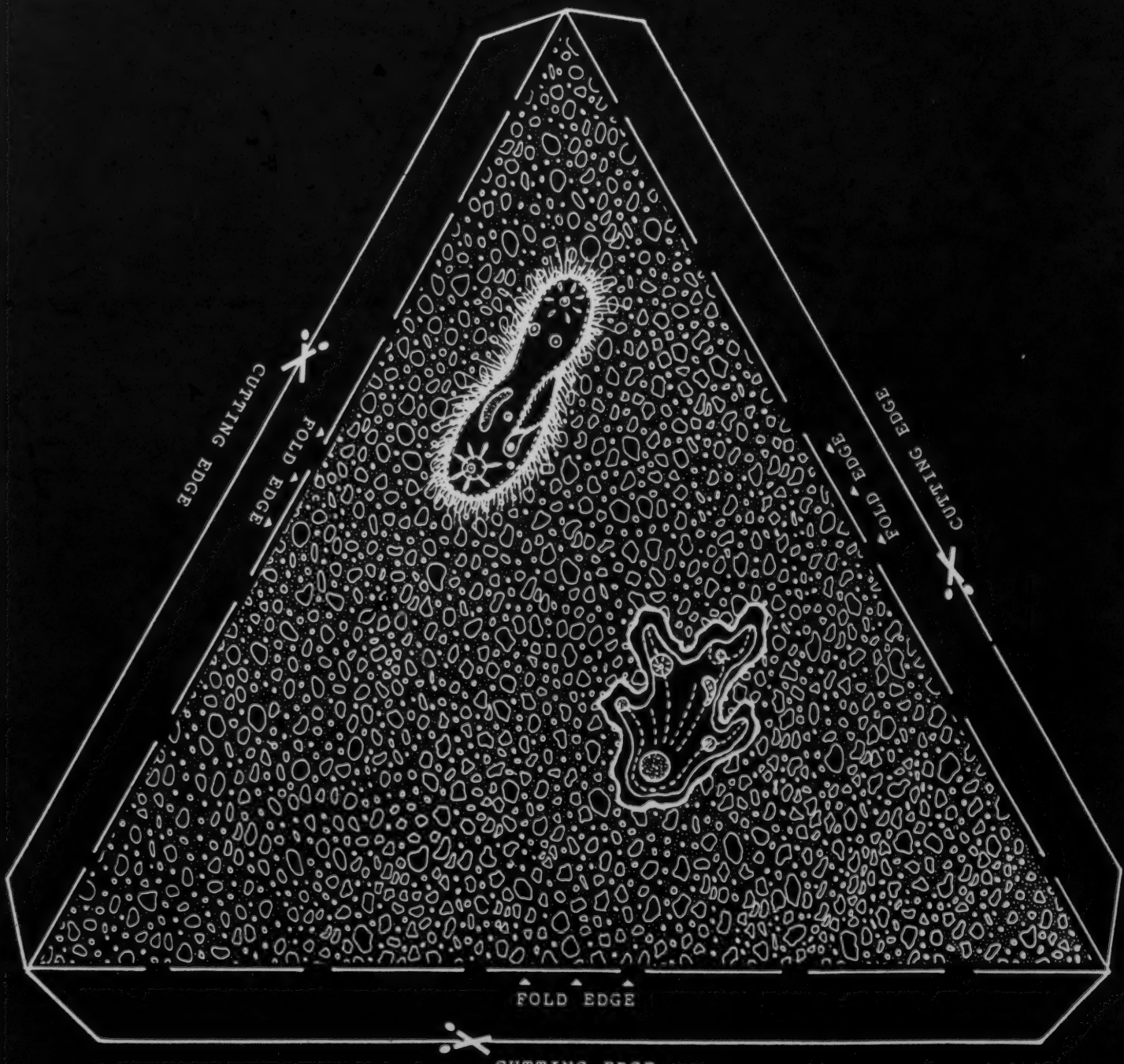
CUTTING EDGE

CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE
FOLD EDGE
CUTTING EDGE

CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE
SHIPSHAPE PART II
FOLD EDGE
CUTTING EDGE

SHIP SHAPE

CUTTING EDGE
FOLD EDGE
CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE


CUTTING EDGE
FOLD EDGE
FOLD EDGE
CUTTING EDGE
FOLD EDGE
CUTTING EDGE